MATH 19-01: HW 10

This assignment concerns a regional map of 100 blocks representing equal population together with racial and party information. Overall demographics: W 70%, B 20%, H 10%; Party affiliation: D 60%, R 40%.

In all of the questions below, you can refer to attached sheets with copies of the regional map.

(1) Show that you can break up a 10×10 grid into 4 contiguous districts so that the average compactness score of the map will be over 75. In this case, what is the expected election outcome?

(2) Now suppose you must district the region into 10 contiguous districts with equal population.
   (a) What is the smallest possible perimeter of a district?

   (b) What is the largest possible perimeter if diagonal squares count as contiguous, and what is the largest possible perimeter if they don't?

(c) Show that a districting map exists for this region with 10 equal-population districts and $C > 50$.

(3) Draw maps with 10 districts each that are as compact as you can while creating likely wins for (a) four Republicans, (b) five Republicans, (c) six Republicans, if possible. Compute C for each plan.

(4) Confirm that the black and Hispanic populations each satisfy the first Gingles factor. Draw districting maps that maximize and that minimize the "opportunity to elect a candidate of choice" for the minority populations. (It's up to you whether to combine them or treat them separately.) Write a paragraph describing each districting plan. What are some factors that could be brought up in court if each plan faced a challenge under the Voting Rights Act?

B DEM	H DEM	H REP	H REP	W REP	W REP	W REP	W REP	W DEM	W DEM
W DEM	H DEM	W DEM	H DEM	W DEM	W DEM	W DEM	W DEM	W DEM	B REP
W REP	H DEM	W REP	W REP	W REP	W DEM	W DEM	W DEM	B REP	W REP
H DEM	B REP	W REP	W DEM	W DEM	W REP	W REP	W REP	W DEM	W DEM
W REP	W REP	W DEM	W DEM	W DEM	W DEM	W DEM	W REP	W DEM	W REP
W DEM	W REP	W DEM	W DEM	W REP	W DEM	W DEM	W DEM	W DEM	W REP
W REP	W DEM	W REP	W REP	W REP	W DEM	W REP	W DEM	B DEM	B DEM
H REP	H DEM	W REP	W DEM	B DEM	B DEM	B DEM	W DEM	B DEM	W REP
W REP	H DEM	W DEM	W DEM	W REP	W REP	B DEM	B DEM	B DEM	W REP
W DEM	W DEM	B DEM	B REP	B DEM	W DEM	B DEM	B DEM	B REP	B REP

B DEM	H DEM	H REP	H REP	W REP	W REP	W REP	W REP	W DEM	W DEM
W DEM	H DEM	W DEM	H DEM	W DEM	W DEM	W DEM	W DEM	W DEM	B REP
W REP	H DEM	W REP	W REP	W REP	W DEM	W DEM	W DEM	B REP	W REP
H DEM	B REP	W REP	W DEM	W DEM	W REP	W REP	W REP	W DEM	W DEM
W REP	W REP	W DEM	W DEM	W DEM	W DEM	W DEM	W REP	W DEM	W REP
W DEM	W REP	W DEM	W DEM	W REP	W DEM	W DEM	W DEM	W DEM	W REP
W REP	W DEM	W REP	W REP	W REP	W DEM	W REP	W DEM	B DEM	B DEM
H REP	H DEM	W REP	W DEM	B DEM	B DEM	B DEM	W DEM	B DEM	W REP
W REP	H DEM	W DEM	W DEM	W REP	W REP	B DEM	B DEM	B DEM	W REP
W DEM	W DEM	B DEM	B REP	B DEM	W DEM	B DEM	B DEM	B REP	B REP